IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of

YAMADA et al

Atty. Ref.: 829-595

Serial No. (to be assigned)

Group:

Filed: December 21, 2001

Examiner:

For: LIQUID CRYSTAL DISPLAY DEVICE AND METHOD FOR PRODUCING THE SAME

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December 21, 2001

Assistant Commissioner for Patents
Washington, DC 20231

Sir:

PRELIMINARY AMENDMENT

Please amend the above-identified application as follows:

IN THE SPECIFICATION

Please replace the paragraph beginning at page 61, line 6, with the following rewritten paragraphs:

Referring to Figures 10A through 10D, the basic structure and operation principle of a liquid crystal display device 100 in the present embodiment will be described. Figure 10A is a schematic cross-sectional view of the liquid crystal display device 100 when no voltage is being applied, and Figure 10B is a schematic cross-sectional view thereof under the application of a voltage. Figure 10C shows results obtained by observing the upper surface of the liquid crystal display device 100 shown in Figure 10A

with a polarizing microscope in crossed-Nicols, and Figure 10D shows results obtained by observing the upper surface of the liquid crystal display device 100 shown in Figure 10B with a polarizing microscope in crossed-Nicols.

Please replace the paragraph beginning at page 63 (through page 64, line 5), line 11, with the following rewritten paragraph/s:

The liquid crystal molecules 42 are aligned in a direction vertical to the substrates 32 and 34 by an alignment regulating force of the hemeotropic alignment layers 38a and 38b when no voltage is being applied as shown in Figure 10A. When the pixel regions are observed with a polarizing microscope in crossed-Nicols when no voltage is being applied, a dark field of view (normally black mode) is exhibited as shown in Figure 10C. Upon the application of a voltage, the liquid crystal molecules 42 having a negative dielectric anisotropy $\Delta\varepsilon$ are provided with a force which aligns the major axes of the liquid crystal molecules 42 in a direction vertical to the electric field direction. Therefore, the liquid crystal molecules 42 are tilted from the direction vertical to the substrates as shown in Figure 10D (gray-scale display state). When the pixel regions in this state are observed with a polarizing microscope in crossed-Nicols, extension patterns are observed in the directions of polarization axes.

Please replace the paragraph beginning at page 97, line 2311, with the following rewritten paragraph/s:

Polarizing plates 161 were disposed in crossed-Nicols on both sides of the cell, whereby a liquid crystal display device was produced. The cross-sectional structure of the liquid crystal layer in the liquid crystal display device thus obtained was substantially the same as that of the liquid crystal display device shown in Figure 4A and 4B, except that the cross-section of the homeotropic alignment layer 134b had the shape of a mortar as shown in Figure 19A (polarizing plates are not shown). Since the homeotropic alignment layer 134b has a cross-section in the shape of a mortar, a differential coefficient of a curve showing changes in thickness with respect to the position (from a central portion of a pixel to a peripheral portion thereof) is positive, and a differential coefficient of a curve showing changes in thickness of the liquid crystal layer in the pixel region is negative.

Please replace the paragraph beginning at page 111, line 15, with the following rewritten paragraph/s:

Polarizing plates 161 were disposed in crossed-Nicols on both sides of the cell, whereby a liquid crystal display device was produced.

IN THE CLAIMS

Claims 12 through 21 and 32 through 36 are canceled.

REMARKS

The foregoing amendments correct typographical errors and correspond to the amendments made in the parent application.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page/s is/are captioned "**Version With Markings To Show Changes Made**."

Entry of this preliminary amendment and examination of this application is respectfully requested.

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION

Please replace the paragraph beginning at page 61, line 6, with the following rewritten paragraphs:

Referring to Figures 10A through 10D, the basic structure and operation principle of a liquid crystal display device 100 in the present embodiment will be described. Figure 10A is a schematic cross-sectional view of the liquid crystal display device 100 when no voltage is being applied, and Figure 10B [10C] schematic cross-sectional view thereof under the application of a voltage. Figure 10C [10B] shows results obtained by observing the upper surface of the liquid crystal display device 100 shown in Figure 10A with a polarizing microscope in crossed-Nicols, and Figure 10D shows results obtained by observing the upper surface of the liquid crystal display device 100 shown in Figure 10B with a polarizing microscope in crossed-Nicols.

Please replace the paragraph beginning at page 63 (through page 64, line 5), line 11, with the following rewritten paragraph/s:

The liquid crystal molecules 42 are aligned in a direction vertical to the substrates 32 and 34 by an alignment regulating force of the hemeotropic alignment layers 38a and 38b when no voltage is being applied as shown in Figure 10A. When the pixel regions are observed with a polarizing microscope in crossed-Nicols when no voltage is being applied, a dark field of view (normally black mode) is exhibited as shown in Figure 10C

[10B] the application of a voltage, the liquid crystal molecules 42 having a negative dielectric anisotropy $\Delta\varepsilon$ are provided with a force which aligns the major axes of the liquid crystal molecules 42 in a direction vertical to the electric field direction. Therefore, the liquid crystal molecules 42 are tilted from the direction vertical to the substrates as shown in Figure 10D [10B] (gray-scale display state). When the pixel regions in this state are observed with a polarizing microscope in crossed-Nicols, extension patterns are observed in the directions of polarization axes.

Please replace the paragraph beginning at page 97, line 2311, with the following rewritten paragraph/s:

Polarizing plates 161 were disposed in crossed-Nicols on both sides of the cell, whereby a liquid crystal display device was produced. The cross-sectional structure of the liquid crystal layer in the liquid crystal display device thus obtained was substantially the same as that of the liquid crystal display device shown in Figure 4A and 4B, except that the cross-section of the homeotropic alignment layer 134b had the shape of a mortar as shown in Figure 19A (polarizing plates are not shown). Since the homeotropic alignment layer 134b has a cross-section in the shape of a mortar, a differential coefficient of a curve showing changes in thickness with respect to the position (from a central portion of a pixel to a peripheral portion thereof) is positive, and a differential coefficient of a curve showing changes in thickness of the liquid crystal layer in the pixel region is negative.

Please replace the paragraph beginning at page 111, line 15, with the following rewritten paragraph/s:

Polarizing plates 161 were disposed in crossed-Nicols on both sides of the cell, whereby a liquid crystal display device was produced.

IN THE CLAIMS

Cancel claims 12 through 21 and 32 through 36.